

Energy conservation— another alternative

Figure 8.17 Making
compost

INSTRUCTIONS

Here's an ideal way to get rid of all sorts of organic waste, e.g. food scraps, egg shells, tea leaves, coffee grounds, grass clippings and leaves. You can use just about any organic matter—the more water it has in it, the faster it will decay.



1 Buy a ready-made compost bin or build your own from old planks, wire mesh or corrugated iron. You should, ideally, have two compost heaps so that the first will have rotted down while the second is built. Each heap should be a minimum of 1.5 m x 1.5 m by 1 m high.

Earlier in this chapter, you learned that energy conservation was just as important as finding new sources of energy. In fact, research has found that the cost of energy conservation is actually cheaper than finding alternatives.

Energy conservation is a straightforward idea and can be most effective in the home, where most energy is used. There are several ways in which all people could contribute to the concept, wherever they live:

- **Home and work** (the buildings): designing buildings to make better use of natural energy sources, using energy-efficient appliances.
- **Transport** (mobility choices): considering the use of public transport to work, or alternatives, such as car pooling, bicycles and walking.
- **Consumer products** (what we use up in the course of living): recycling bottles (glass), aluminium/tin, paper, plastics (PET), composting vegetable matter (see Figure 8.17).
- **Water** (vital to every human being): dual-flush toilets, taking shorter showers and more efficient car washes.

2 Choose a dry, well-drained position for the heaps (soggy waste will become stagnant and smelly).

3 Build the compost heap in 10–15 cm layers, starting with branches and twigs, to allow air to circulate. Best results occur with alternating layers of leaves or torn-up newspapers with softer grass cuttings.

4 Every 30 cm (approx.), add some soil or manure.
5 Remember to add fresh matter regularly, rather than in huge lumps.

6 If compost heap becomes smelly, add some straw to mix with grass cuttings.

7 To prevent top layer drying out, use a damp sack on top.

8 If you wish to speed up process, activators can be purchased and used.

9 When heap is full, top with small amount of soil and leave for a few months before use.

There are many ways in which people could be more energy-efficient in their lives and these will be addressed in the final section of this chapter.

EXERCISE 7

OPTION A

- 1 Using some strategy ideas from the previous page, map out a plan for the following scenarios:
 - a recycling around the home
 - b recycling program for your school
- 2 Refer to the instructions given in Figure 8.17 and create a compost bin for your garden or school. Record the state of your progress after each session and evaluate the success of the final result.

If strategies already exist in your home or school, describe their method of operation and evaluate their success.

OPTION B

- 1 Visit a local supermarket and survey the packaging of various products on the shelves. Identify and list the types of products and the companies involved where there appears to be unnecessary use of packaging.
- 2 Contact the various companies involved, expressing your views and concern over their apparent packaging wastage. Keep a class record of the successful responses and any action taken.
- 3 Write a letter to the editor of your local newspaper outlining the details of your project, what you discovered about these companies and what else needs to be done.

OPTION C

- 1 a Using a copy of the sample audit sheet given in Figure 8.18, conduct a personal family energy audit of the home.
 - b Compare your results with those of others in the class.
 - c Discuss areas where improvements could be made in each other's homes.
 - d Ask your family if you can implement your revised energy plan in your home!
- 2 a As a class project, conduct a school energy audit. Adapt Figure 8.18 to suit the needs and structure of the school environment.
 - b Produce a map of the whole school, showing the distribution of energy wastage. Use a key to identify regions that are high, medium and low in their energy wastage.
 - 3 Devise a school strategy plan to improve energy efficiency.

An environmental investigation of your school is an excellent topic for a **Community Problem Solving (CmPS) Project**, another aspect of the International Problem Solving Program. Read **Skill Sheet 12** and the community problem solving project in Chapter 6 (page 168–9) for information on this type of project.

EXERCISE 7 (cont.)

	Maximum rating	Rating of your house
● Insulation in ceiling (other than foil)	13	
● Insulation in walls (other than foil)	7	
● Reflective foil insulation under roof	4	
● Reflective insulation in walls	3	
● Living areas mainly in north side (southern hemisphere)	10	
● Utility rooms mainly on south and west side	3	
● Living area windows protected from summer sun	8	
● Concrete floor	8	
● 50/50 concrete/timber floor	2	
● Brick, concrete or stone walls inside	6	
● Windows and internal doors placed to give quick cross-ventilation on cool summer nights	5	
● Weathershields on external doors	4	
● Draught seals to windows of living areas	2	
● Draught seals to internal doors of toilet, laundry	2	
● Damper/draught control device for open fireplace	3	
● Doors to close off heated areas	4	
● Curtains/blinds have pelmets or top cover	4	
Trees and shrubs:		
● Shade windows in summer	4	
● Shade walls in summer	2	
● Shade outdoor living areas in summer	2	
● Provide break to cold winter winds	2	
● Provide break to hot summer winds	2	
Shade living area windows in winter	-6	
Unshaded east or west windows to living areas	-10	
Large east or west facing windows	-6	
Skylights over kitchen or living area	-6	
Glass roofs in living or sleeping areas	-10	
Timber floor in living areas	-4	
Permanent open wall vents in heated areas	-4	

TOTAL DESIGN RATING

Legend

- Essential
- Important
- Desirable

(Houses with a rating below 55
are not considered energy efficient)

Figure 8.18 Energy audit sheet for the home (Centre for Education and Research in Environmental Strategies (CERES), Brunswick, Victoria)

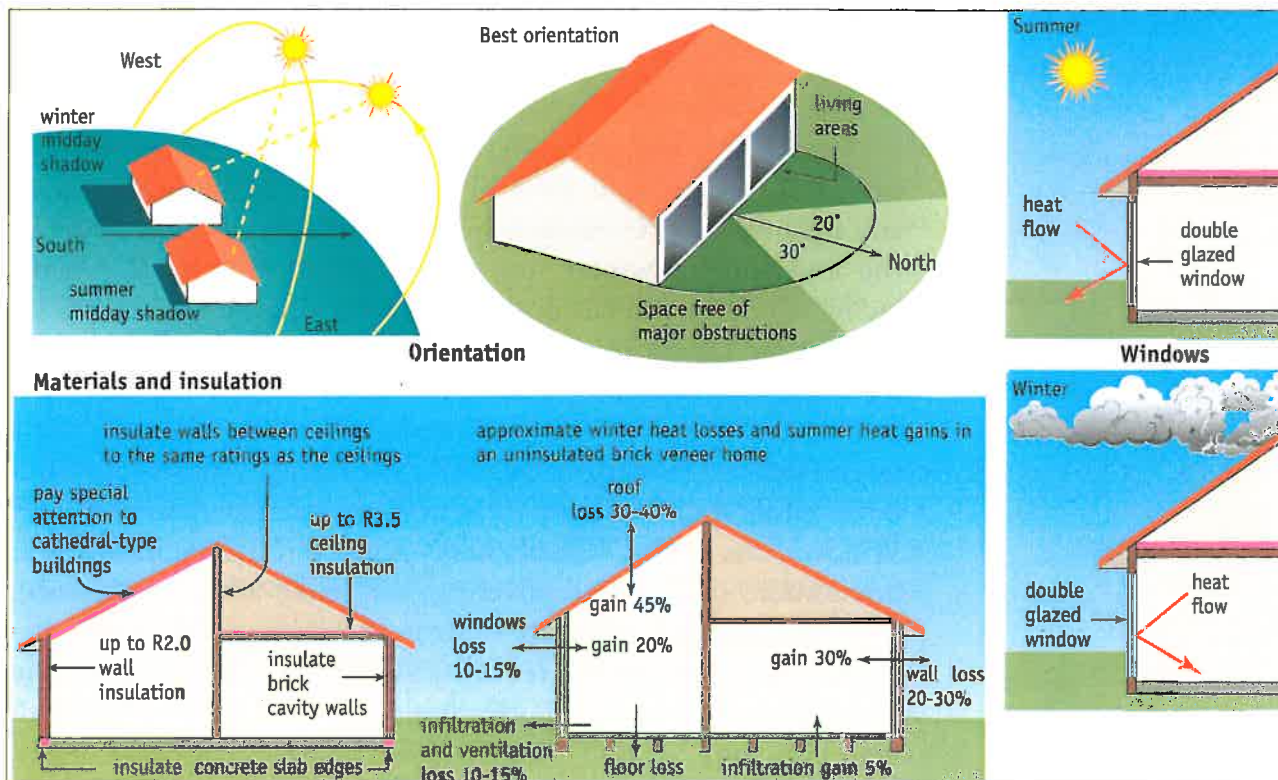
Our future

What can people do to help conserve future energy resources and the comfortable lifestyle that most aim to achieve? The answers lie all around us, especially in the houses we live in and the personal choices we make. Too often, our homes are furnaces in summer and freezers in winter, but recent studies and building trends have proved that living comfortably with extremes of temperature does not have to be difficult; it is just a matter of being energy-efficient. Most research indicates that about 18% of all energy used in Australia goes into heating and cooling buildings, and this produces harmful Greenhouse gases, with their consequences.

To understand the concept of energy efficiency, various factors need to be considered. Some of these are illustrated in Figures 8.19 and 8.20. They include the following:

- **Orientation of the block:** It is possible to maximise free solar energy by choosing a block which allows the house's largest side to face **north** in the southern hemisphere. This is most effective

Figure 8.19 Energy efficiency in the home (Adapted from CERES, Brunswick, Victoria)



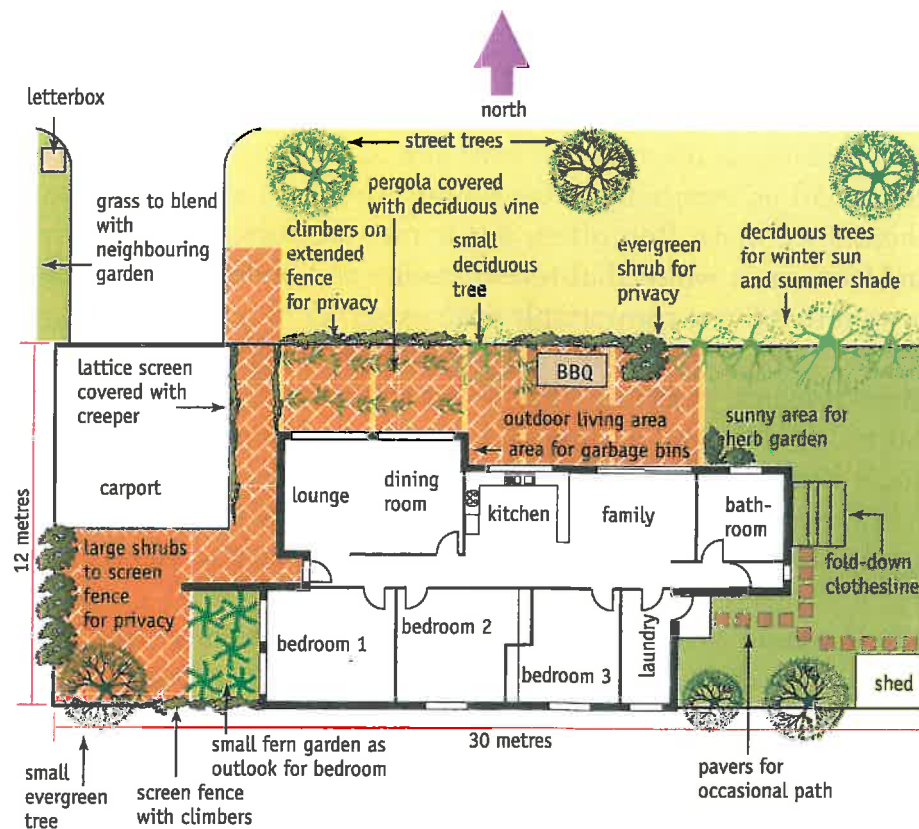


Figure 8.20 How landscaping can help to make a home energy-efficient (Adapted from CERES, Brunswick, Victoria)

for a brick house with most of its windows facing north. Eaves and pergolas help to exclude hot summer sun while allowing in the lower-angled winter sun, thus warming the house. North-facing windows also cut down the daytime lighting costs.

- **Vegetation:** Landscaping of the garden can help in energy conservation too. This can be achieved by keeping evergreen trees well away from the north of the house, planting trees and shrubs on the east and west to provide summer shading, and using ground cover rather than paving in front of north-facing windows.
- **Windows:** As almost 40% of energy is lost through windows, size, orientation, shading and coverings can make a huge difference. Double-glazed windows are designed to maximise thermal efficiency (and minimise power bills). Also, methods such as sealing windows can prevent air escaping. (Pelmets and curtains can help here too).

- **Materials:** The best materials to use are those with a high **thermal mass**. An ability to store heat will help stabilise temperatures throughout the year. The best known example is concrete, and slabs of this type are found beneath most new houses. This is because sunlight falling through north-facing windows is absorbed by the slab. The heat is stored by the concrete at night and keeps the house warm. Consequently, if the windows are shielded in summer, the concrete will remain cool. Full brick houses also retain heat once the house is warm, as well as absorbing noise. These houses are more expensive to build, but the energy savings offset initial expense in the long run.
- **Insulation:** Insulation is very effective if used properly. Insulation in ceilings can reduce heating and cooling bills by 30%. If the walls are insulated too, these costs can be reduced even further.

Energy efficiency in practice: a case study of CERES

The Centre for Education and Research in Environmental Strategies (CERES) is a place where energy-efficient ideas are put into practice. The centre is located in Brunswick, an inner suburb of Melbourne, Victoria, on what was originally a rubbish dump. It was transformed by community action into an environmental centre and city farm.

CERES offers a wide range of opportunities linked to major environmental issues and local urban concerns, and it caters for all age groups. Examples of relevant programs specifically tailored to energy efficiency are:

- **Energy:** Students experience hands-on models, experiments and working examples in the Energy Park, e.g. water wheel, wind swing, solar pump and composting toilet. They can also investigate the grid-interactive energy system unique to Melbourne (called Project Aurora) and Alternative Solar Workshop.
- **Low-energy house:** Students see and test energy conservation practices.
- **Living in the greenhouse:** Demonstrations and experiments are conducted to show the implications of the Greenhouse Effect on the world, in particular, rising sea-levels.
- **Recycling:** The actual methods are used all around CERES, e.g. glass bottles, compost, biomass and so on.

Figure 8.21 Programs available at CERES



Wind turbine—part of Project Aurora



Foreground—water wheel
Background—wind turbine and solar panels, part of Project Aurora



Wind swing—demonstrating the power of the wind



Production of methane by 'digestors'

These programs can be seen in the photographs shown in Figure 8.21.

Arguably, one of the most innovative programs at CERES is the low-energy house. This is a standard inner urban weatherboard house that has been modified to reduce its energy consumption and increase the comfort for residents. Low or moderate cost features combine to overcome many of the problems which can make a house a big energy user. These include insulation, weatherstripping, double-glazing, a greenhouse to capture more of the winter sun, solar hot water, solar air heaters, and the use of plants in the garden for shading. The house also demonstrates environmentally friendlier approaches to urban living, including water conservation, recycling, composting and growing food.

The low-energy house provides many opportunities to investigate and test some of the devices and energy-efficient features. Some of these have been identified in Figure 8.22.

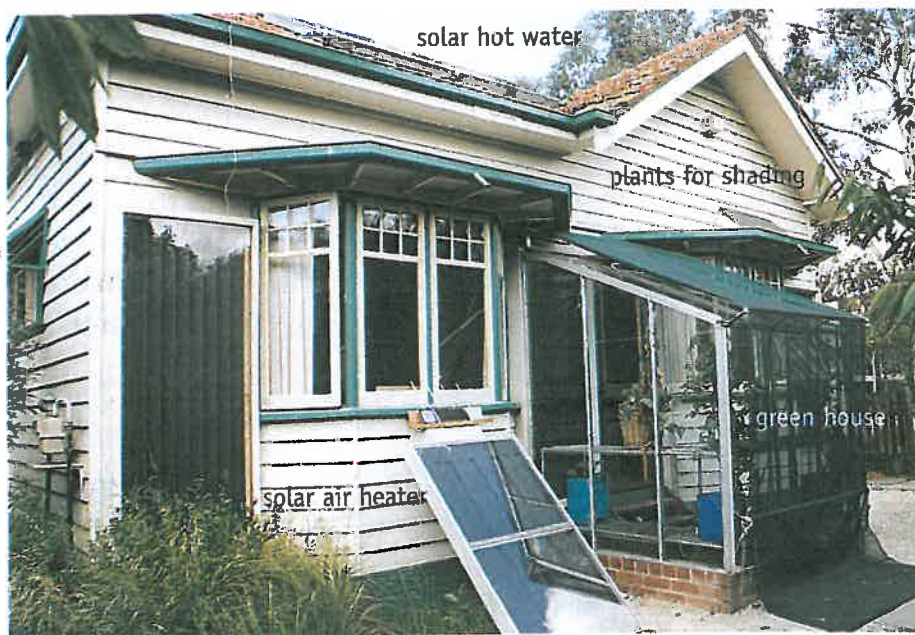


Figure 8.22 The low-energy house at CERES

The **window box greenhouse** (Figure 8.23a) is a simple addition onto the side of a window which can help to heat a room during winter and provides a suitable environment for growing small plants. It is simply a glass box placed over a north-facing window, which allows low winter sunlight to heat up air inside the box. In

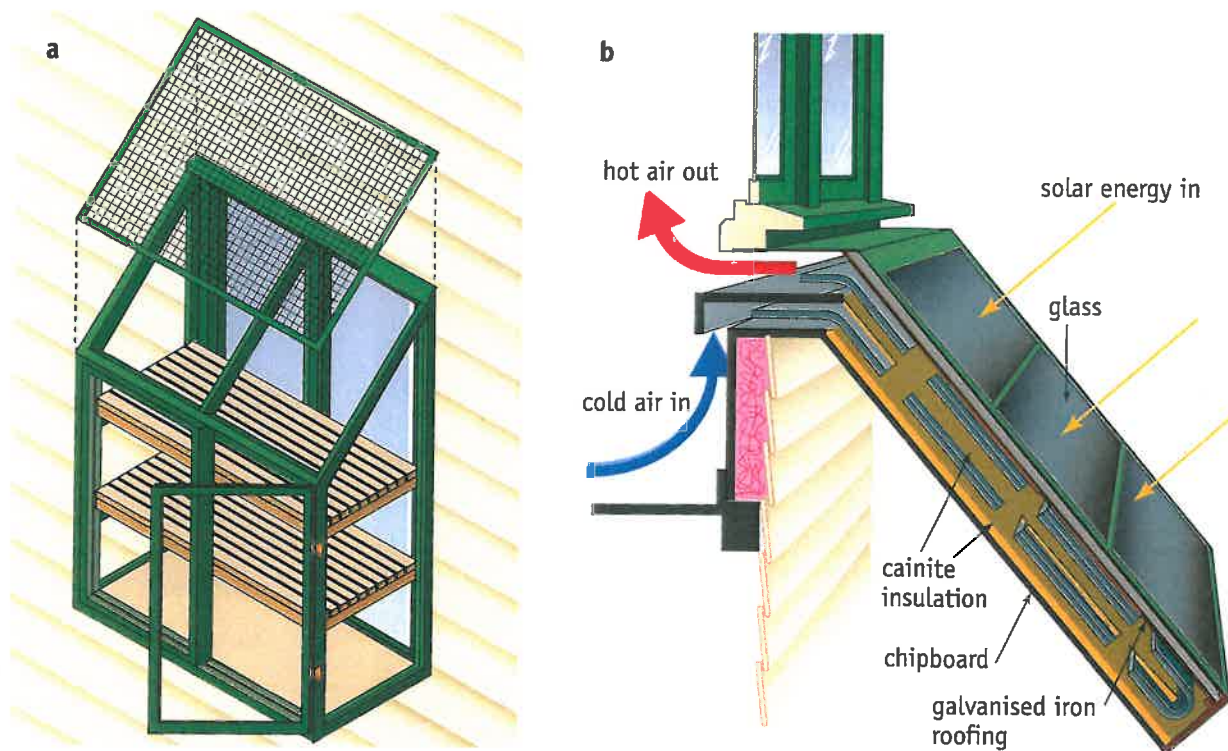


Figure 8.23

a A window box greenhouse (Adapted from Energy Information Leaflet No. 3, CERES, Brunswick, Victoria)
b The window box air heater (Adapted from Energy Information Leaflet No. 2, CERES, Brunswick, Victoria)

turn, this warms up the room as the heated air passes through the open window. Small plants, ornamental and productive, have a warm, sunny environment to grow in during winter inside the window box greenhouse and can also create a visually pleasant natural atmosphere (see Figure 8.22).

Instructions on how to build these devices can be obtained from CERES.

The **window box air heater** (Figure 8.23b) can be a cheap, simple and efficient way to help stay warm in winter. It can be built to any size depending on your needs. You can also choose whether you wish to fix it permanently into place or design it to be removed in summer when not needed. It is one of the simplest forms of solar heater. Basically, it is an insulated wooden box with a glass top and a sheet of blackened metal inside. The Sun shines through the glass top and heats the blackened metal sheet. This in turn heats the air in part of the box which then rises by itself up through an opening into your house. At the same time cooler air is drawn in and in turn heated.

Solar hot water systems use the Sun's energy to directly heat water, in much the same way as water in a hose left on the lawn gets hot on a sunny day. Water is heated as it circulates through flat, glazed panels, located on the roof of a house. The heated water is then stored in an insulated storage tank, usually located directly above the collectors (Figure 8.24). An auxiliary heater is also included in the system, in order to boost water temperatures on days when solar energy may not be enough to meet all hot water requirements. Boosters may be run on off-peak electricity, gas or solid fuel. In most solar systems, a pump is not required. Heated water rises naturally through the solar energy collectors and enters the storage tank. When this happens, cooler water at the base of the storage tank is forced out and flows down to the bottom of the collectors. This cycle is continuously repeated while the Sun is shining. Most commercially available hot water systems employ this 'natural' cycle, commonly referred to as **thermosyphon flow**.

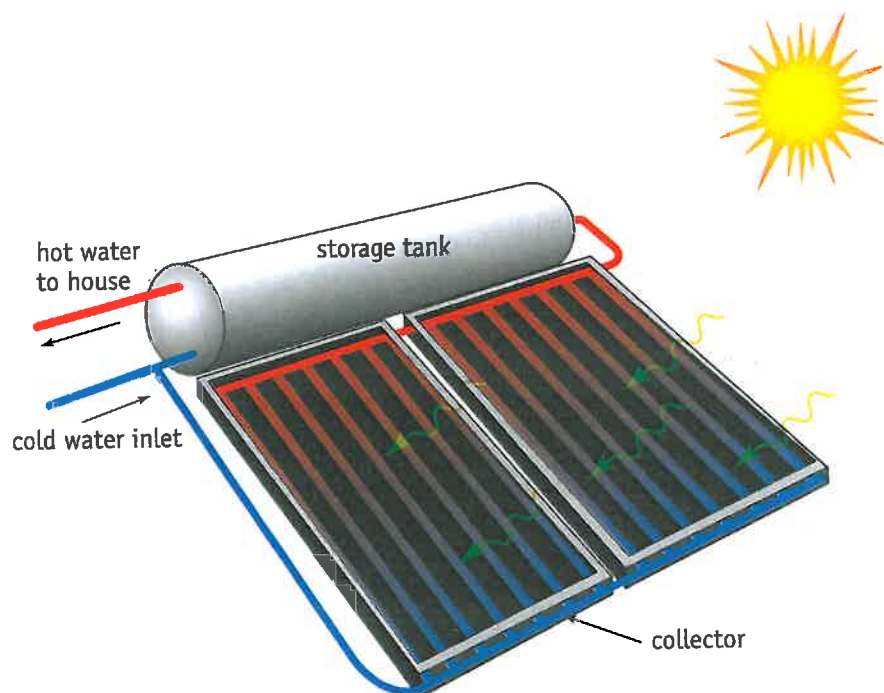


Figure 8.24 A simple solar hot water system (Adapted from CERES, Brunswick, Victoria)

A visit to the CERES low-energy house can inspire anyone to change the efficiency of their own house. CERES is open all year round (except for public holidays) and is a refreshing rural oasis in the hustle bustle of city living.

EXERCISE 8

OPTION A

- 1 Using the photos in Figure 8.25, which were taken in the grounds of CERES, make a list of all of the energy-efficient features that you can identify.
- 2 What evidence of modern-day living is obvious in both photographs?
- 3 Try this experiment to test the strength of the Sun's energy.

You will need:

- a billy full of water
- several large mirrors
- thermometer
- access to the Sun's rays

Position the billy one metre above the ground. Stand the mirrors about three metres from the billy, leaning them at an appropriate angle, in order to direct the Sun's rays onto the billy. Take temperature readings every 10 minutes and see how long the water takes to boil (see Figure 8.26).

OPTION B

- 1 Through your local or State electricity company, find out if there are any local grid-connected renewable energy systems in your State, like Project Aurora at CERES. Research information about these sites and present it as an annotated visual display. The design should demonstrate the main principles of CERES and how the customer can save money on the design.
- 2 Investigate what is meant by the 'R' rating on different types of insulation. You may like to



Figure 8.25 Energy-efficient features at CERES



Figure 8.26 The 'boiling billy' experiment at CERES

test the effectiveness of some by designing your own experiments.

OPTION C

Research the vast array of energy-efficient ideas and devices that are available today. Using this

information, design and build a three-dimensional model of an energy-efficient house.